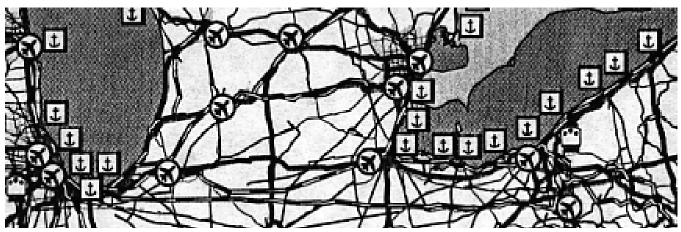
Part I

The State of the Transportation System

chapter one

The Transportation System



The United States has the world’s largest transportation system, serving the 265 million people and 6 million business establishments that occupy the fourth largest nation by land area. The interlocking elements of the transportation system include not only the physical links among places—highways, transit systems, railroads, airports, waterways and ports, and pipelines—but the firms that provide transportation services, the many industries that produce and maintain vehicles, and agencies with transportation responsibilities at all government levels. Americans are highly mobile and American businesses ship more freight per capita than any other country. Passenger-miles per person averaged 16,500 miles in 1995 (not including miles traveled in heavy trucks), while 12,600 ton-miles of freight were generated per capita. The transportation facilities that made this possible included, among other things, 3.9 million miles of public roads, 170,000 miles of railroad track operated by freight carriers, 44,000 transit buses, 40,000 U.S.-flag vessels, and 200,000 miles of oil pipelines (see table 1-1). These transportation facilities supported 4.3 trillion miles of passenger travel and 3.6 trillion ton-miles of goods movement. (USDOT BTS 1996, 15, 20)

This chapter provides an overview of the extent, use, condition, and physical performance of the transportation system, updating the discussion in earlier editions of the *Transportation Statistics Annual Report*. For 1997, one mode, urban

Table 1-1.
Major Elements of the Transportation System: 1995

Mode	Major defining elements	Components
Highways[1]	Public roads and streets; automobiles, vans, trucks, motorcycles, taxis, and buses (except local transit buses) operated by transportation companies, other businesses, governments, and households; garages, truck terminals, and other facilities for motor vehicles	*Public roads* 45,744 miles of Interstate highway 111,237 miles of other National Highway System roads 3,755,245 miles of other roads *Vehicles and use* 136 million cars, driven 1.5 trillion miles 58 million light trucks, driven 0.7 trillion miles 6.9 million freight trucks, driven 0.2 trillion miles 686,000 buses, driven 6.4 billion miles
Air	Airways and airports; airplanes, helicopters, and other flying craft for carrying passengers and cargo	*Public use airports* 5,415 airports *Airports serving large certificated carriers*[2] 29 large hubs (67 airports), 393 million enplaned passengers 33 medium hubs (59 airports), 86 million enplaned passengers 58 small hubs (73 airports), 34 million enplaned passengers 561 nonhubs (593 airports), 14 million enplaned passengers *Aircraft* 5,567 certificated air carrier aircraft, 4.6 billion miles flown[3] *Passenger and freight companies* 86 carriers, 506 million domestic revenue passenger enplanements, 12.5 billion domestic ton-miles of freight[3] *General aviation* 181,000 aircraft, 2.9 billion miles flown[4]
Rail[5]	Freight railroads and Amtrak	*Railroads*[6] 125,072 miles of major (Class I)[7] 18,815 miles of regional 26,546 miles of local 24,500 miles of Amtrak *Equipment* 1.2 million freight cars 18,812 freight locomotives *Freight railroad firms* Class I: 10 companies, 185,782 employees, 1.3 trillion ton-miles of freight carried Regional: 30 companies, 10,647 employees Local: 500 companies, 13,269 employees *Passenger (Amtrak)* 23,646 employees, 1,722 passenger cars,[8] 313 locomotives,[8] 20.7 million passengers carried[9]

Table 1-1.
Major Elements of the Transportation System: 1995 ***(continued)***

Mode	Major defining elements	Components
Transit[10]	Commuter trains, heavy-rail (rapid-rail) and light-rail (streetcar) transit systems, local transit buses, vans and other demand response vehicles, and ferry boats	*Vehicles* 43,577 buses, 17.0 billion passenger-miles 8,725 rapid rail and light rail, 11.4 billion passenger-miles 4,413 commuter rail, 8.2 billion passenger-miles 68 ferries, 243 million passenger-miles 12,825 demand response, 397 million passenger-miles
Water	Navigable rivers, canals, the Great Lakes, the St. Lawrence Seaway, Intracoastal Waterway, and ocean shipping channels; ports; commercial ships and barges, fishing vessels, and recreational boats	*U.S.-flag domestic fleet*[11] Great Lakes: 698 vessels, 60 billion ton-miles Inland: 31,910 vessels, 306 billion ton-miles Ocean: 7,033 vessels, 440 billion ton-miles Recreational boats[12]: 11.7 million *Ports*[13] Great Lakes: 362 terminals, 507 berths Inland: 1,811 terminals Ocean: 1,578 terminals, 2,672 berths
Pipeline[14]	Crude oil, petroleum product, and natural gas lines	*Oil* Crude lines: 114,000 miles of pipe, 323 billion ton-miles transported Product lines: 86,500 miles of pipe, 269 billion ton-miles transported 161 companies, 14,900 employees *Gas* Transmission: 276,000 miles of pipe Distribution: 919,000 miles of pipe 19.7 trillion cubic feet, 150 companies, 187,200 employees

[1] U.S. Department of Transportation, Federal Highway Administration. 1995. *Highway Statistics*. Washington, DC.
[2] U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information. 1996. *Airport Activity Statistics of Certificated Air Carriers, 12 Months Ending December 31, 1995*. Washington DC.
[3] Preliminary data.
[4] U.S. Department of Transportation, Federal Aviation Administration. 1997. *General Aviation and Air Taxi and Avionics Survey, Calendar Year 1995.* Washington, DC.
[5] Except where noted, figures are from Association of American Railroads. 1996. *Railroad Facts.* Washington, DC.
[6] Miles of track operated.
[7] Includes 891 miles of road operated by Class I railroads in Canada.
[8] Amtrak. 1997. *Twenty-Fifth Annual Report, 1996.* Washington, DC.
[9] Excludes commuter service.
[10] U.S. Department of Transportation, Federal Transit Administration. 1997. *National Transit Database, 1995.* [cited as of 5 August 1997] Available at www.fta.dot.gov/library/reference/sec15/1995/index.html.
[11] Excludes fishing and excursion vessels, general ferries and dredges, derricks, and so forth used in construction work. Vessel data from U.S. Army Corps of Engineers. 1996. *Transportation Lines of the United States.* New Orleans, LA. Ton-miles data from U.S. Army Corps of Engineers. 1996. *Waterborne Commerce of the United States,1995*. New Orleans, LA.
[12] U.S. Department of Transportation, United States Coast Guard. 1996. *Boating Statistics*. Washington, DC.
[13] Ports data from U.S. Department of Transportation, Maritime Administration. 1996. *A Report to Congress on the Status of the Public Ports of the United States, 1994–1995.* Washington, DC. October.
[14] Data are for 1994.

SOURCE: Unless otherwise noted, U.S. Department of Transportation, Bureau of Transportation Statistics. 1996. *National Transportation Statistics 1997*. Washington, DC. December.

transit, is profiled in detail. The chapter concludes with a discussion of selected transportation events that occurred in 1996. Other aspects of the system's performance, its economic role and its unintended consequences for safety, energy import dependency, and the environment, are discussed in subsequent chapters of Part I of this report, which concludes with an analysis of data and information needs in the rapidly changing world of transportation.

Passenger Transportation

Passenger transportation, measured by passenger-miles traveled (pmt), continues to grow, and per capita travel growth appears to have accelerated during the last 25 years. Overall, pmt, excluding miles traveled by heavy trucks, grew from approximately 2.2 trillion in 1970 to 4.3 trillion in 1995, a 2.7 percent average annual increase. Again, excluding miles traveled by heavy trucks, per capita miles traveled in 1995 were 16,500, up from 11,000 in 1970, which was an annual rate of 1.6 percent over the 25 year period—1.1 percent annually from 1970 to 1980, 1.8 percent annually from 1980 to 1990, and 2.3 percent annually from 1990 to 1995. (USDOT BTS 1996)

As discussed in more detail in chapter 7, many factors contribute to the increase in pmt. The resident population increased by nearly 59 million, a rise of 29 percent between 1970 and 1995. The number of people in the labor force, most of whom commute to work, grew twice as fast as the population over the same period (from 83 million to 132 million, a 59 percent increase). The number of working women and women looking for work increased from 32 million in 1970 to 61 million in 1995. People also have more money to spend on transportation, particularly automobiles and air travel. Disposable personal income per capita rose from $12,000 in 1970 to $18,800 in 1995 (in chained 1992 dollars), a 56 percent increase. (USDOC 1996)

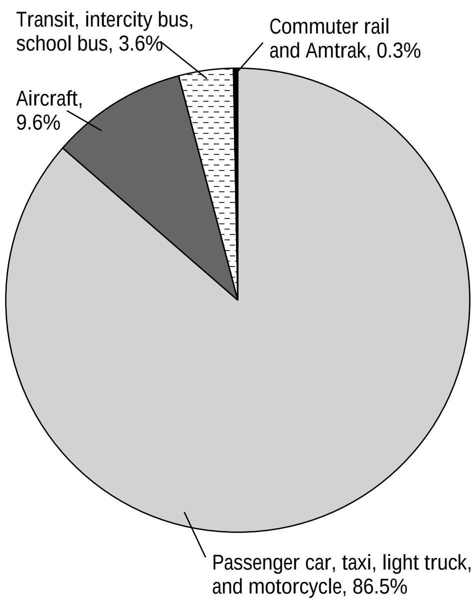
The vast majority of pmt, 87 percent in 1995, took place in personal vehicles (including cars, light trucks, taxis, and motorcycles) (see figure 1-1). Despite enormous growth in pmt by personal vehicles, their percentage of total pmt declined from 90 percent in 1970 because of the more rapid growth of air travel. Nearly 10 percent of pmt was by air, 4 percent by transit, intercity bus, and school bus, and 0.3 percent by rail (both Amtrak and commuter rail). Passenger-miles traveled in light trucks (including pickups, minivans, and sport utility vehicles) rose from 9 percent of all pmt in 1970 to 21 percent in 1995. (USDOT BTS 1996)

Despite the increase in motorized transportation, nonmotorized forms of transportation remain an important way to travel. In 1990, about 8 percent of all trips were made by nonmotorized transportation (7.2 percent on foot and 0.7 percent by bicycle), a drop from 9.3 percent in 1983. (USDOT FHWA 1993, 4-58; USDOT FHWA 1986, 6-5) As pedestrian and bicycle trips are short, averaging 0.6 miles and 2 miles, respectively, they accounted for less than 1 percent of all person-miles in 1990. Because of their low cost, minimal impact on the natural environment, and positive impact on public health, the U.S. Department of Transportation carried out research to seek new ways to encourage walking and bicycling to fulfill people's mobility needs. (See USDOT FHWA 1994) Trends in personal mobility are discussed in much greater detail in chapter 7.

Freight Transportation

The transportation of freight reached 3.65 trillion ton-miles in 1995, about 3.5 percent more than in 1994. From 1970 to 1995, freight ton-

Figure 1-1.
Passenger-Miles Traveled, by Mode: 1995



SOURCE: Various sources as cited in U.S. Department of Transportation, Bureau of Transportation Statistics. 1996. *National Transportation Statistics 1997.* Washington, DC. December.

miles rose 2 percent annually.[1] There are several reasons for this trend other than growth in the general population and economy. These include the increasingly complex logistics of production, more international trade, technological improvements allowing more trading of perishable goods, and the implementation of information technologies allowing just-in-time delivery systems.

According to the 1993 Commodity Flow Survey (CFS—conducted by the Bureau of Transportation Statistics (BTS) and the Census Bureau), for-hire and private trucking is the most dominant mode of freight transportation in the United States. Trucks moved 72 percent of freight by value and 53 percent by tonnage. About 26 percent of ton-miles moved by rail and 24 percent by water.[2] These modes of transportation are particularly important for the movement of bulk commodities, like coal, grain, mineral ores, and oil. Although air freight moves a minute proportion of total ton-miles (less than 1 percent), the value of freight moved and the price paid for such movement are high; air freight ton-miles have grown nearly sixfold since 1970. Freight movement and the CFS are discussed in greater detail in chapter 9.

System Extent and Use

Overall, the U.S. transportation system continues to change and expand in response to a variety of factors, especially increased demand from travelers and freight shippers. This section outlines the changes and trends that have occurred in the system from 1994 to 1995, and, in some instances, since 1980. Urban transit trends are discussed in a separate section of this chapter.

Railroads

The rail system at the end of 1995 included 10 major freight carriers, known as Class I railroads, which dominated the industry, and 530 regional and local railroads. Information about Class I railroads is quite extensive and informs most of the discussion here. More limited information is available for smaller railroads, and some is presented here (see ASLRA 1995 for more details).

In the Class I railroad industry, track is decreasing while rail stock, both locomotives and railcars, is increasing. In 1995, there were 180,000 miles of track owned, about 2 percent less than in 1994, continuing a trend evident for much of this century.[3] (Between 1980 and 1995, miles of track declined by about one-third, from 271,000 miles.) Conversely, the 18,800 freight

[1] These figures do not include local truck freight movements or non-Class I rail.

[2] These estimates were calculated by BTS from final datasets in the 1993 CFS, plus additional data on waterborne and pipeline shipments not fully covered in the CFS (see USDOT BTS 1997).

[3] The term *miles of track* adds up all railroad multiple main tracks, yard tracks, and sidings. In contrast, *miles of road* counts only the total length of the roadway operated, excluding yard tracks and sidings, and any multiple mainline tracks. (AAR 1996, 44)

locomotives in service in 1995 was nearly 2 percent more than in 1994. The number of freight railcars also increased by 2 percent between 1994 and 1995, to 1.2 million. (AAR 1996, 50) Despite less track, revenue ton-miles grew from 1.20 trillion in 1994 to 1.31 trillion in 1995, and since 1980 have increased by 42 percent. (AAR 1996, 27)

Capital expenditures on equipment and roadway and structures in the freight rail industry have been increasing. Total spending was $6.0 billion in 1995, up from $4.9 billion one year earlier (unadjusted for inflation). At the same time, the number of employees in the Class I, regional, and local freight railroads fell from 213,000 at the end of 1994 to 210,000 at the end of 1995. The year-end number of people working for Class I railroads fell from 189,000 in 1994 to 186,000 in 1995. (AAR 1995 and 1996, 3)

The 10 Class I railroad companies operating at the end of 1995 were two fewer than at the end of 1994.[4] (AAR 1995 and 1996) Another recent development of note was the creation of the Surface Transportation Board (STB), which took over the regulatory functions of the Interstate Commerce Commission. STB began operating on January 1, 1996, and in 1996 approved the Union Pacific acquisition of Southern Pacific. In 1997, STB was examining a proposed acquisition of Conrail by Norfolk Southern and CSX Transportation.

At the end of 1995, there were 30 regional and 500 local railroad companies. The regionals operated nearly 19,000 miles of road, employed 10,600 people, and had revenue of $1.5 billion. Local railroads operated 26,500 miles of road, employed 13,000 people, and had revenue of $1.4 billion. (AAR 1996, 3)

[4] During 1995, the Chicago and North Western Transportation Company was acquired by the Union Pacific Company, and the Burlington Northern Railroad Company merged with the Atchison, Topeka, and Santa Fe Company.

Intercity rail passenger service is provided primarily by Amtrak (the National Railroad Passenger Corporation). Amtrak operated nearly 24,500 miles of road in 1995, but owned only 750 miles. (AAR 1996) The number of passenger locomotives and passenger cars in service declined between fiscal year (FY) 1994 and FY 1995. (Amtrak 1997)

Capital expenditures by Amtrak amounted to $617 million in FY 1995, up from $323 million in FY 1994 (unadjusted for inflation). During 1995, Amtrak raised fares, cut routes, and reduced its losses. Average employment during the year was nearly 24,000, down about 1,000 from the previous year. (AAR 1995 and 1996)

The number of Amtrak passengers decreased from 21.2 million in FY 1994 to 20.7 million in FY 1995. Passenger-miles traveled over the same period fell from 5.9 billion to 5.5 billion, but this is still higher than the 4.5 billion in 1980. (USDOT BTS 1996)

Highways

The public road system continues to expand, although much more slowly than the growth in the number of vehicles. Urban and rural roads totaled 3.91 million miles in 1995, up from 3.86 million in 1980, a 1 percent increase.[5] Lane mileage (including lanes added due to road widening) has increased faster. Between 1985 and 1995, lane mileage on nonlocal roads increased by 3 percent, from 2.70 million miles to 2.78 million miles. The number of highway vehicles (excluding transit vehicles), however, has increased much faster than road length, going from 161 million in 1980 to 205 million in 1995, a 27 percent increase. (USDOT FHWA Various years)

Highway vehicle-miles traveled (vmt) by all vehicles in 1995 was 2.42 trillion, up from 2.36 trillion in 1994 and 1.53 trillion in 1980.

[5] These figures are for length of public roads only, and do not include private roads.

(USDOT FHWA Various years) Vehicle-miles traveled by automobiles and light trucks accounted for 92 percent of the vmt in 1995, with most of the rest traveled by trucks.

In September 1996, the first roads designated as "All-American Roads" and "Scenic Byways" (under the National Scenic Byways program created by the Intermodal Surface Transportation Efficiency Act of 1991—ISTEA) were announced by then-Secretary of Transportation Frederico Peña. The All-American Roads are: the Selma to Montgomery March Byway in Alabama; the Route 1, Pacific Coast Highway in California; the San Juan Skyway and Trail Ridge Road/ Beaver Meadow Road in Colorado; the Natchez Trace Parkway in Mississippi, Tennessee, and Alabama; and the Blue Ridge Parkway in North Carolina. Fourteen national scenic byways were designated in 12 states. The program is designed to recognize and enhance already existing special highway corridors, and grants totaling $62.4 million have been awarded for the development of programs and related services (in fiscal years 1992 through 1996). Designated roads will receive priority for funding under the program. A second set of roadway designations is expected to be made in 1997. (USDOT 1996)

Air Transportation

After many years of growth, the total number of airports (including civil and joint civil-military airports, heliports, STOLports, and seaplane bases) declined slightly between 1994 and 1995, from 18,343 to 18,224, still well above the 15,161 operated in 1980. (USDOT BTS 1996, 6) This change was due primarily to the variation in the number of general aviation (GA) airports. Private-use airports constitute 70 percent of these airports, and 96 percent of all airports are used by GA aircraft. General aviation airports are usually rudimentary facilities; only about half have paved runways and about one-quarter have lighted runways. The number of civil certificated airports (serving air carrier operations with aircraft seating more than 30 passengers) has declined somewhat. Between 1994 and 1995, the number of these airports declined from 577 to 572. There has been an increase in the number of airports with Federal Aviation Administration (FAA) towers or FAA-contracted towers from 434 in 1994 to 447 in 1995.[6] (USDOT FAA 1997a) Since 1980, the number of heliports doubled, reaching 4,617 in 1994. (USDOT FAA Various years).

In 1995, there were 5,567 aircraft available for service by U.S.-flag certificated air carriers, an increase of 7 percent from the previous year. (USDOT BTS 1996, 33) Since 1980, the number of such aircraft almost doubled. The available seat-miles as a result increased from 427 billion in 1980 to 803 billion in 1994. (Aviation Week Group 1997) By contrast, the number of GA aircraft in 1995 was 181,000, a significant drop since 1980 when there were over 200,000. (USDOT FAA 1997b)

The number of air carriers rose slightly from 82 in 1994 to 86 in 1995. (USDOT BTS 1996, 209) There were 72 air carriers in 1980. The number of air carrier employees increased from 586,000 in 1994 to 609,000 in 1995, up from 354,000 in 1980. (USDOT BTS 1996, 209)

The number of enplanements (including international passengers) on certificated carriers at U.S. airports grew to 559 million in 1995, up from 541 million in 1994 and 303 million in 1980. (USDOT BTS 1996)

Water Transportation

The U.S. oceangoing merchant fleet over 1,000 gross tons consisted of 512 vessels in 1995, totaling 19 million deadweight tons. Of these, 322 were owned privately and the rest (190) were

[6] Preliminary data.

owned by the Maritime Administration (MARAD). All but 12 of the MARAD-owned ships were inactive, either in reserve or pending disposal. By contrast, most of the privately owned ships (292) were in the active fleet. The private U.S. oceangoing fleet ranked 23rd in number of ships and 11th by deadweight tons in the world. Of the 512 public and private vessels in 1995, 182 were tankers, 171 were intermodal vessels, 125 were general cargo ships, 21 were bulk carriers, and 13 were passenger carriers. (USDOT MARAD 1996a)

The domestic fleet, including the inland waterways, Great Lakes, and oceangoing vessels (vessels of all sizes, self-propelled and nonself-propelled), totaled nearly 40,000 in 1995, with a cargo capacity of 67 million short tons and a passenger capacity of 377,000. (US Army Corps of Engineers 1996c) Vessels using the inland waterways made up 80 percent of the entire fleet (a large proportion of these being nonself-propelled barges for dry cargo). Ships on the Atlantic, Gulf, and Pacific coasts made up another 18 percent, and the remaining 2 percent worked the Great Lakes.

In 1995, there were 1,940 public and private deep-draft terminals at ocean and Great Lakes ports, with 3,179 berths. Approximately 75 percent of these terminals were privately owned. General cargo berths made up 38 percent of all berths, 22 percent were dry bulk berths (e.g., for coal, grain, or ore), liquid bulk berths made up 20 percent (e.g., for crude and refined petroleum), and passengers berths accounted for 3 percent. The remaining 18 percent were classified as "other" (e.g., berths for barges, for mooring, or inactive berths). (USDOT MARAD 1996b, 20)

Inland waterway ports and terminals generally have shallow water depths (14 feet or less), and can be located in many places on the 25,000 miles of navigable inland rivers and intracoastal waterways, providing more flexibility than coastal ports. In 1995, there were about 1,800 river terminals in 21 states, of which about 89 percent were privately owned. Of these terminals, approximately 4 percent were for general cargo, 58 percent were for dry bulk cargo, 27 percent were for liquid bulk cargo, and 11 percent were multipurpose. (USDOT MARAD 1996b, 24)

Capital expenditures in 1994 on public ports amounted to $930 million, a 42 percent increase over 1993. The increase reflects the purchase of a large tract of land for current and future development of a port in the South Pacific (California) Region of the United States. Even excluding the money spent to hold this land for future development ($243 million), twice as much was spent on public ports in the South Pacific Region as in any other. The next largest expenditures were in the South Atlantic Region, including ports in Virginia, Georgia, North and South Carolina, and Florida. Analysis of public port expenditures in 1994 reveals that the industry spent most heavily on specialized cargo facilities (35 percent of the total) and conventional general cargo facilities (23 percent) (see table 1-2). (USDOT MARAD 1996b, 27)

Total freight moved by water increased by 12 percent between 1980 and 1995. Imports and exports grew much faster than domestic shipments, increasing by 25 percent between 1980 and 1995, while domestic shipments increased by 1 percent. (US Army Corps of Engineers 1996d) Fifty-five percent of domestic shipments by water take place along the coasts, totaling 440 billion ton-miles. Shipments by inland waterways make up another 38 percent and lakewise transport constitutes the remaining 7 percent. Inland waterways shipments are the only form of domestic water transportation that increased over the past 15 years. Between 1980 and 1995, inland waterways movement increased by 35 percent, while coastwise move-

Table 1-2.
U.S. Port Capital Expenditures: 1994

Type of expenditure	Amount (thousands)	Percent
Total	$686,620	100.0
Specialized cargo	239,236	34.8
General cargo	156,213	22.8
Dry bulk	38,240	5.6
Passenger	32,536	4.7
Liquid bulk	2,169	0.3
Other	49,790	7.3
Infrastructure	144,664	21.1
Off terminal	103,641	15.1
On terminal	41,023	6.0
Dredging	23,772	3.5

NOTE: Excludes $243 million land purchase in the South Pacific Region (California).

SOURCE: U.S. Department of Transportation, Maritime Administration. 1996. *A Report to Congress on the Status of the Public Ports of the United States, 1994–1995.* Washington, DC.

ment decreased by 30 percent, and lakewise movement declined by 3 percent. (USDOT BTS 1996, 20) Tonnage handled by major U.S. ports in 1995 is shown in figure 1-2.

Pipelines

Oil pipeline mileage increased slightly between 1993 and 1994 (from 199,000 miles to 201,000 miles), but is still below the 218,000 miles that existed in 1980. Pipelines for crude oil movement decreased from 130,000 miles in 1980 to 114,000 in 1994, while oil product lines fell slightly from 89,000 miles to 87,000 miles over the same period. The number of Federal Energy Regulatory Commission-regulated pipeline companies increased from 130 in 1980 to 161 in 1995, while the number of oil pipeline employees decreased from 21,300 to 14,900 over the same period. (USDOT BTS 1996)

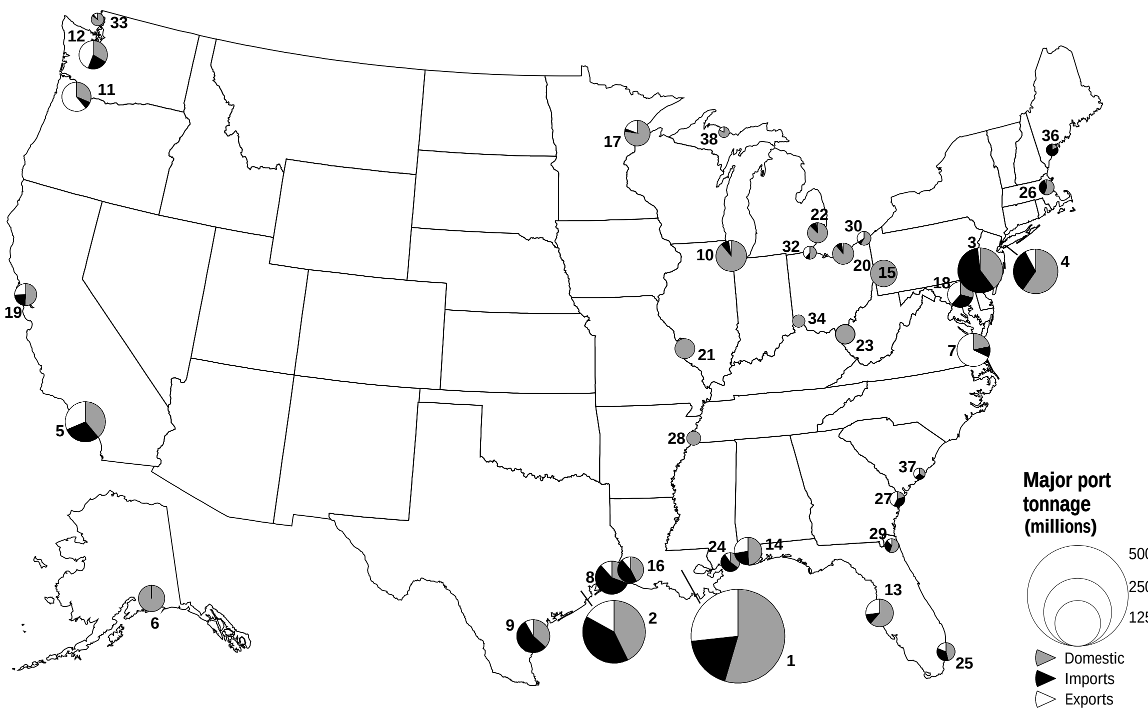
Natural gas pipelines totaled 1.2 million miles in 1994 (up slightly from 1993). Distribution lines are three-quarters of this total mileage; transmission, field, and gathering lines make up the other quarter. Since 1980, the length of pipeline has increased by 24 percent, mostly on the distribution side. Transmission pipeline increased by only 3 percent over this period. In 1994, there were 150 interstate natural gas pipeline companies (an increase of 15 from 1993) employing about 187,000 people, 28,000 fewer than in 1980 when there were 91 companies in the industry. (USDOT BTS 1996, 246)

Since 1980, the annual pipeline throughput of natural gas has been around 20 trillion cubic feet. In 1994, throughput was 19.7 trillion, up from 19.0 trillion in 1993. Ton-miles of crude oil and petroleum products were 599 billion in 1995, roughly the same as 1994, but up slightly from 1980 (588 billion ton-miles). (USDOT BTS 1996)

Condition and Performance of the Transportation System

Accurate information about the physical condition and performance of the transportation system can provide the basis for informed decisions about future investments. This section discusses the condition and performance of each transportation mode (except urban transit, which is profiled separately). It updates the detailed discussion in the 1996 *Transportation Statistics Annual Report*, which summarized the Department of Transportation's (DOT) biennial report to Congress on the condition and performance of the nation's surface transportation system, and also examined air transportation. While there is some new information to report this year, the data are scattered and not comparable across modes.

Figure 1-2.
Tonnage Handled by Major U.S. Ports: 1995



1. **South Louisiana**
   Port of South Louisiana
   New Orleans, LA
   Baton Rouge, LA
   Port of Plaquemine, LA
2. **Houston–Galveston**
   Houston, TX
   Galveston, TX
   Texas City, TX
   Freeport, TX
3. **Delaware River**
   New Castle, DE
   Wilmington, DE
   Marcus Hook, DE
   Chester, PA
   Paulsboro, NJ
   Philadelphia, PA
   Camden-Gloucester, NJ
4. **New York, NY and NJ**
5. **Los Angeles–Long Beach**
   Los Angeles, CA
   Long Beach, CA
6. **Valdez, AK**
7. **Norfolk-Newport News**
   Norfolk, VA
   Newport News, VA
8. **Beaumont–Port Arthur**
   Beaumont, TX
   Port Arthur, TX
9. **Corpus Christi, TX**
10. **Chicago-Gary**
    Chicago, IL
    Gary, IN
    Indiana Harbor, IN
    Burns Waterway Harbor, IN
    Buffington, IN
11. **Columbia River**
    Portland, OR
    Vancouver, WA
    Longview, WA
    Kalama, WA
12. **Puget Sound**
    Seattle, WA
    Tacoma, WA
    Everett, WA
    Olympia, WA
13. **Tampa, FL**
14. **Mobile, AL**
15. **Pittsburgh, PA**
16. **Lake Charles, LA**
17. **Duluth–Superior, MN and WI**
18. **Baltimore, MD**
19. **San Francisco Bay**
    San Francisco, CA
    Oakland, CA
    Richmond, CA
20. **Cleveland–Lorain**
    Cleveland, OH
    Lorain, OH
    Fairport Harbor, OH
21. **St. Louis, MO**
22. **Detroit**
    Detroit, MI
    St. Clair, MI
    Marine City, MI
    Monroe, MI
23. **Huntington, IN**
24. **Pascagoula, MS**
25. **South Florida**
    Miami, FL
    Port Everglades, FL
26. **Boston**
    Boston, MA
    Salem, MA
27. **Savannah, GA**
28. **Memphis, TN**
29. **Jacksonville, FL**
30. **Ashtabula**
    Ashtabula, OH
    Conneaut, OH
31. **San Juan, PR**
32. **Toledo, OH**
33. **Anacortes, WA**
34. **Cincinnati, OH**
35. **Honolulu, HI**
36. **Portland, ME**
37. **Charleston, SC**
38. **Presque Isle, MI**

NOTE: Major ports were defined as having at least one port with over 10 million tons shipped in 1995, and were combined with other ports in the same major waterway or located in the same metropolitan statistical area with at least 1 million tons shipped in 1995.

SOURCE: U.S. Army Corps of Engineers. 1996. *Waterborne Commerce of the United States: Calendar Year 1995.* New Orleans, LA.

Highway Transportation

One of the most important aspects of highway systems is the condition of the roads. Table 1-3 shows the condition of the Interstate Highway System and other heavily used roads, measured by pavement roughness. The data show: 1) rural Interstates are in better condition than urban Interstates, although there has been some improvement in the condition of urban Interstates; 2) improvement between 1994 and 1995 in almost all road categories.

The condition of roads, and trends in their condition, are difficult to establish because of a

Table 1-3.
Highway Pavement Conditions: 1994 and 1995
(In percent)

Type of road	Year	Poor	Mediocre	Fair	Good	Very good	Total miles reported
Urban							
Interstates	1994	13.0	29.9	24.2	26.7	6.2	12,338
	1995	10.4	26.8	23.8	27.5	11.4	12,307
Other freeways and	1994	5.3	12.7	58.1	20.9	2.9	7,618
expressways	1995	4.8	9.8	54.7	20.4	10.3	7,804
Other principal arterials	1994	12.5	16.3	50.8	16.6	3.8	38,598
	1995	12.4	14.7	47.2	15.9	9.7	41,444
Rural							
Interstates	1994	6.5	26.5	23.9	33.2	9.9	31,502
	1995	6.3	20.7	22.3	36.9	13.9	31,254
Other principal arterials	1994	2.4	8.2	57.4	26.6	5.4	89,506
	1995	4.4	7.6	51.1	27.9	9.0	89,265
Minor arterials	1994	3.5	10.5	57.9	23.6	4.5	124,877
	1995	3.7	9.0	54.7	23.9	8.7	121,443

KEY: Poor = needs immediate improvement.
Mediocre = needs improvement in the near future to preserve usability.
Fair = will be likely to need improvement in the near future, but depends on traffic use.
Good = in decent condition; will not require improvement in the near future.
Very good = new or almost new pavement; will not require improvement for some time.

NOTE: Interstates are held to a higher standard than other roads, because of higher volume and speed.

SOURCE: U.S. Department of Transportation, Federal Highway Administration. 1995 and 1996. *Highway Statistics.* Washington, DC. Table HM-64.

change instituted over the past few years in the Highway Performance Monitoring System. The technique used to measure pavement condition is shifting from the Present Serviceability Rating (PSR) to the International Roughness Index (IRI). The Federal Highway Administration (FHWA) believes that the IRI provides a more objective standard than the PSR, and will provide a fairer way of comparing road conditions between states. Currently, the IRI is being used to measure Interstates, principal arterials, and rural minor arterials, while the PSR measures rural major collectors and urban minor arterials and collectors. Rural minor collectors are not being measured. (USDOT FHWA 1996) Surface roughness is not, however, a complete measure of highway condition (although it is an input to models that predict pavement deficiencies). FHWA is currently developing protocols for measuring other problems including rutting, cracking, and faulting. The next *Condition and Performance Report,* due to be released at the end of 1997, should provide fuller information about recent trends in bridge and highway condition, and congestion.

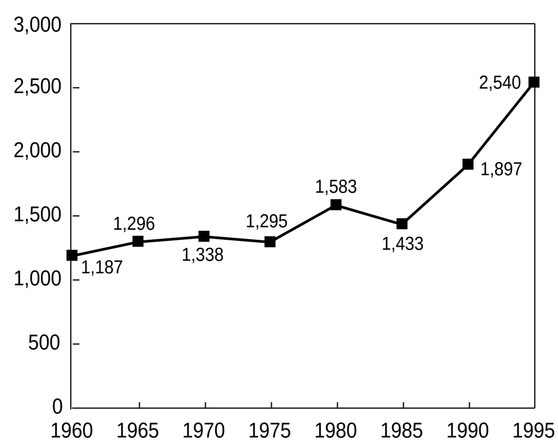
Another element of overall highway system condition and performance is the automobile fleet. The characteristics of the vehicles operated have important implications for energy consumption, pollution, and safety. The U.S. automobile fleet has grown and aged significantly over the past 15 years, and consequently there has been a decrease in the percentage of vmt in new cars. (Pisarksi 1995)

Finally, highway performance has been measured by level of service (LOS), over a range from LOS A (free flow conditions) through LOS F (stop and go traffic). Recurring congestion, indicating that traffic overwhelms the capacity of the system, is defined as LOS D (speeds beginning to decline and minor incidents cause queuing) and below. LOS D equates to a volume-service flow ratio (V/SF) of 0.8, or 80 percent of capacity. The V/SF measures the flow of traffic in relationship to a theoretical determination of the capacity. A V/SF of 0.8 or above was found to occur for 68 percent of urban Interstate highway peak-hour vehicle travel in 1994 (45 percent of the urban Interstate mileage), slightly lower then the 70 percent in 1991 and 1992, but still much higher than the 52 percent in 1980. (USDOT FHWA 1996, V6-7) (In 1995, the calculation of capacity was changed and, hence, 1995 is not comparable with earlier years. The 1995 figure was 55 percent of the urban Interstate peak-hour travel). While the V/SF measures the severity of congestion, it does not indicate the duration of congestion. One indicator of the severity and duration of congestion is provided by the Texas Transportation Institute (TTI), which assesses the delay in hours in 50 urban areas. (TTI 1996) TTI estimates that congestion nearly doubled from 7.3 million daily person-hours in 1982 to 14.2 million in 1993.

Rail Transportation

The recent history of rail freight transportation is very different when contrasted with the passenger side of the industry. Rail freight is experiencing increased traffic and revenues, and improved physical condition, despite less track. Amtrak, the nation's passenger rail carrier, has experienced decreasing patronage, mounting losses, and a deteriorating physical stock. In fiscal year 1996, Amtrak had a net operating loss of $764 million, a decline from $808 million in fiscal year 1995. (Amtrak 1997) Overall, freight train-miles per mile of rail track owned, a crude guide to congestion, increased from 1,200 in 1960 to 2,500 in 1995 (see figure 1-3). (This does not include passenger and commuter rail services that may run over the same track). Freight capacity constraints are most noticeable in the West, where most of the growth in train-miles has occurred. Train-miles increased by 42 percent between 1985 and 1995 in the West and by 16 percent in the East. (AAR 1996, 33) Since 1990, growth rates in the East and the West have been the same. Simply calculating train-miles per mile of track, however, does not take account of technological improvements that allow more trains to run on the same amount of track, and more freight to be carried on a train. Nevertheless, the rail industry considers capacity constraints as an issue. (Welty 1996)

Figure 1-3.
Freight Train-Miles per Mile of Track Owned: 1960–95



SOURCE: Association of American Railroads. 1996. *Railroad Facts: 1996 Edition.* Washington, DC.

▶ Passenger Rail

In 1995, Amtrak locomotives were on average 13.9 years old, a slight increase from the 1994 average of 13.4, but almost twice the age of locomotives in 1980. Despite aging locomotives, Amtrak reports that the percentage of locomotives available for service in 1995 was 88 percent, higher than in 1994 (85 percent) or even 1980 (83 percent). Although the average age of passenger railcars dropped slightly between 1994 and 1995, the average of 21.8 years in 1995 was much higher than the average age in 1980 (14.3 years). The percentage of railcars available for service in 1995 was 90 percent, a slight improvement over 1994 and much higher than the 1980 total of 77 percent. (USDOT BTS 1996)

On-time performance of Amtrak passenger trains improved in 1995 to 76 percent from 72 percent in 1994 and 1993. In 1996, however, on-time performance fell back to 71 percent. In 1996, short- and long-distance trains were on time 76 percent and 49 percent, respectively. (Amtrak 1997)

▶ Freight Rail

Judging by the introduction of new rail stock, the physical condition of freight rail carriage continues to improve. In 1995, 901 new locomotives were introduced into service, the third straight annual increase and almost three times the number introduced in 1992.

The labor productivity of the U.S. freight rail system, the highest in the world, has increased further over the last few years. In 1992, metric ton-kilometers per employee (mtk/employee) for U.S. Class I railroads were approximately twice as high as the Canadian rail system, at about 4 million metric mtk/employee, making it second behind the United States. Most western European countries were below 1 million metric mtk/employee in the early 1990s. (Galenson and Thompson 1994, Annex B) Some efficiency gains in the United States have resulted, because of the abandonment of branch lines since deregulation. Between 1994 and 1995, revenue ton-miles per employee-hour increased by 9 percent to 2,746. Since 1980, revenue ton-miles per employee-hour tripled, and since 1970, grew nearly fivefold. (AAR 1996, 41)

Air Transportation

There are several performance measures for air transportation, including on-time statistics and numbers of passengers denied boarding. A flight is considered on-time if it arrives at the gate less than 15 minutes after the scheduled arrival time. Canceled and diverted flights are considered late. In 1996, the proportion of on-time flights for major air carriers was 74.5 percent, a drop from 78.6 in 1995. (USDOT BTS OAI 1997) Weather accounted for 75 percent of the delay in 1994. Terminal volume was responsible for another 19 percent. Closed runways/taxiways and problems with National Airspace System equipment were responsible for 2 percent each of the delays. The remaining 2 percent of delays resulted from other causes. (USDOT FAA 1996)

The number of passengers denied boarding increased from 824,000 in 1994 to 843,000 in 1995. (USDOT BTS 1996, 55) This is a very small number, and when total passengers enplaned is taken into account, the rate of denial drops slightly.

Water Transportation

About the only measure of water transportation system and vessel condition is age. The number of locks owned and operated by the Army Corps of Engineers was 275 in 1995. Of these, 61 percent were opened before 1960. (US Army Corps of Engineers 1996a). Of the 8,281 self-propelled vessels in the domestic fleet at the end of 1995, 46 percent were over 20 years old. Of the non-self-propelled vessels, 35 percent were over 20 years old. (US Army Corps of Engineers 1996b)

National measures of the overall performance of water transportation, such as port and lock congestion, are not available. The Performance Monitoring System for inland waterways, however, provides data on average processing time, lock closure, average time closed, and lock traffic for individual locks. (US Army Corps of Engineers 1996a)

Pipelines

As pipelines age, corrosion can reduce their ability to support stress and higher pressures. Preventive maintenance and replacement can, of course, offset the effects of aging, but incidents still occur. In the gas industry in 1995, there were 161 incidents, resulting in 18 fatalities and 53 injuries, less than in 1994, when there were 221 incidents with 21 fatalities and 110 injuries. In the oil pipeline industry, there were 188 incidents in 1995 causing 3 fatalities and 11 injuries, far fewer than the 244 incidents and 1,858 injuries in 1994. (USDOT BTS 1996, 153)

Special Profile: Urban Transit[7]

Beginning in the 1960s, a major infusion of government financial assistance halted—and eventually began to reverse—a post-World War II decline in transit service and ridership. Local public agencies were created to take over transit operations of financially distressed private operations. From 1975 to 1985, federal, state, and local governments contributed more than $40 billion to finance these newly created public transit authorities' day-to-day operating expenses, one-third more than passengers contributed in fare revenues. Transit service in U.S. cities (as measured by the number of vehicle-miles operated) expanded almost 20 percent between 1975 and 1985 (erasing much of the previous decade's loss in service), while nationwide transit ridership grew by nearly 15 percent. (APTA 1985 and 1990)

Nearly 400 local public agencies provided bus transit service in U.S. cities during 1985, while 29—primarily in the nation's oldest and largest cities—operated one or more forms of rail mass transit (see table 1-4). Together these agencies served nearly 300 of the nation's urbanized areas, with many of the largest cities receiving service from several transit operators.

Since 1985, the number of urban areas served has increased slightly, and vehicle-miles have increased an additional 13 percent. Service con-

Table 1-4.
Extent of U.S. Urban Transit Service

Transit mode	Operators 1985	Operators 1995	Urban areas served 1985	Urban areas served 1995
All modes	407	398	298	316
All rail modes[1]	29	34	14	22
Heavy rail	12	13	10	11
Light rail	8	16	8	16
Commuter rail	15	16	8	10
Bus	392	381	298	316

[1] These numbers do not add because some rail operators provide more than one mode of transit and some urban areas are served by more than one mode of transit.

SOURCE: (1) U.S. Department of Transportation, Federal Highway Administration. 1986. *National Urban Mass Transportation Statistics, 1985.* Washington, DC. (2) U.S. Department of Transportation, Federal Transit Administration. 1996. *1994 National Transit Database.* Washington, DC

[7] This section is largely based on the Federal Transit Administration's (FTA's) Section 15 database (now known as the National Transit Database). Demand response service is omitted, as it historically served a much different market than conventional service, although this may be changing due to implementation of the 1990 Americans with Disabilities Act (see chapter 8). While many operators provide demand response service, total ridership is small. A full account of the transit industry would also include transit provided in rural areas (FTA Section 18 operators) and to persons with special needs (FTA Section 16 operators).

sumed, measured in passenger-miles traveled, has remained constant at about 37 billion, but ridership has fallen. The overall decline in transit ridership masks differences in ridership by mode and urban area: patronage on some transit services grew rapidly while others registered substantial declines. Although the extent of transit service expanded, overall patronage of transit service (i.e., the fraction of service that was actually used by riders) declined.

The data on transit use can be examined not only from the standpoint of ridership, but also in terms of broader public policy objectives. (USDOT FHWA FTA MARAD 1995, 59–61) Transit systems provide mobility options for many people who are unable to travel by automobile or other private vehicle due to personal circumstances such as income, disability, or age. The mobility needs of such persons, including their use of transit, are discussed in chapters 7 and 8 of this report. In many areas, transit plays a role in strategies for mitigating congestion and air pollution. Some communities are also emphasizing transit in their efforts to enhance the quality of life and reduce urban sprawl. These aspects of transit and their role in metropolitan area planning are discussed in *Transportation Statistics Annual Report 1996.*

Transit Coverage

Between 1985 and 1995, two developments in U.S. urban transit service are notable: an increase in the number of cities served by rail transit; and the continued extension of bus service into the outlying suburban areas of larger metropolitan regions, as well as into smaller urbanized areas. These developments began during the 1970s, and continue to be important factors influencing the extent and pattern of urban transit service. Partly as a result of these developments, the level of urban transit service provided nationwide continued to grow between 1985 to 1995.

The number of local public agencies in U.S. cities that provide rail transit service (including heavy rail, streetcar or light rail, and commuter rail[8]) grew from 29 during 1985 to 34 by 1995, with most of the growth taking place in agencies operating light-rail service (table 1-4). In the same period, the number of metropolitan areas served by some type of rail mass transit grew from 14 to 22, led by a doubling of the number of areas served by light rail. The number of route-miles of rail transit service in U.S. cities increased by about 18 percent between 1985 and 1995[9] (see table 1-5).

The second major development during the 1985 to 1995 period was the continued expansion of bus transit service, into both outlying suburban regions of larger urban areas and into smaller urban areas. The extension of bus service into lower density suburbs began during the 1970s as a response to continued decentralization of population and employment within U.S. metropolitan areas. Suburban service extensions in many metropolitan areas were facilitated by the creation of regional transit authorities, which often extended routes into previously unserved areas in an effort to secure a broader geographic base. Many smaller urban areas established new services, often in response to concerns about automobile-related air pollution and energy consumption, or the mobility of transportation-disadvantaged groups. The number of agencies

[8] Most public agencies that provide commuter rail service contract with private railroads or Amtrak to operate the service.

[9] Since 1985, Baltimore, Buffalo, Denver, Long Beach (California), Portland (Oregon), Sacramento, San Jose, and St. Louis opened new light-rail lines, while San Diego added to the system it inaugurated in 1984. (Most new light-rail lines serve outlying suburbs and operate primarily on exclusive rights-of-way, thus resembling more closely their newer heavy-rail counterparts than traditional streetcar lines.) Atlanta, San Francisco, and Washington, DC, added to their heavy-rail systems, while Los Angeles began service on a new heavy-rail line in 1994. Miami and New Haven added commuter rail service during this period, while Los Angeles and Washington, DC, extended commuter rail services begun during the previous decade.

Table 1-5.
Growth in U.S. Urban Transit Service

Transit mode	Vehicles in rush-hour service 1985	Vehicles in rush-hour service 1995	Vehicles in rush-hour service Change	Vehicle-miles operated (millions) 1985	Vehicle-miles operated (millions) 1995	Vehicle-miles operated (millions) Change	Route-miles serviced 1985	Route-miles serviced 1995	Route-miles serviced Change
All modes	54,437	57,183	5%	2,101	2,377	13%	143,606	163,941	14%
All rail modes	11,832	13,120	11%	626	773	23%	5,251	6,185	18%
Heavy rail	7,673	7,973	4%	445	522	17%	1,322	1,458	10%
Light rail	534	734	37%	16	34	113%	384	568	48%
Commuter rail	3,625	4,413	22%	165	217	32%	3,545	4,159	17%
Bus	42,605	44,063	3%	1,475	1,604	9%	138,355	157,756	14%

SOURCES: (1) U.S. Department of Transportation, Federal Transit Administration. 1986. *National Urban Mass Transportation Statistics, 1985.* Washington, DC. (2) U.S. Department of Transportation, Federal Transit Administration. 1997. *1995 National Transit Database.* Washington, DC.

providing bus transit service in U.S. urban areas declined slightly between 1985 and 1995, yet the number of urban areas, as well as the total route mileage they served, both increased somewhat during the decade (see tables 1-4 and 1-5).

Increases in rail transit vehicles in service and service levels generally paralleled the expansion of route-miles between 1985 and 1995. The rising number of vehicles used to provide rush hour service was similar to the expansion of route mileage, especially for light rail and commuter rail. Growth in the number of vehicle-miles of rail service greatly outpaced the increase in route mileage, particularly for light rail (see table 1-5). This indicates that rail transit provided a high level of service to a limited number of heavily traveled corridors, both in cities historically served by rail and in metropolitan areas where new rail transit lines were added or extended during this period.

In contrast, the growth in the number of buses in service during rush hour was only about one-fifth as large as the increase in bus route mileage during the past decade. Growth in vehicle-miles of service also was less rapid than growth in route mileage. This disparity could be because routes extended into outlying suburban areas or added in smaller urban areas are served less frequently than existing routes, and service frequencies on some bus routes in larger metropolitan areas were reduced as other routes were extended into suburban areas.

Transit Ridership and Utilization

Total urban transit passenger-miles remained constant between 1985 and 1995. Passenger-miles traveled increased for all rail transit modes, but declined for buses. Heavy rail increased slightly, from 10.4 billion pmt in 1984 to 10.6 billion in 1995. Commuter rail pmt increased about 26 percent, reaching 8.2 billion in 1995. Light rail grew the fastest, increasing from about 350 million pmt in 1985 to 860 million pmt in 1995. Bus pmt was about 17 billion in 1995, about 14 percent less than in 1985.

Overall ridership in 1995 was about 11 percent less than in 1985. Some modes gained riders, while ridership on buses and older subways fell (see table 1-6). Increases in transit ridership between 1985 and 1995 were mainly in rail transit services that have opened since the 1970s. Ridership on all rail transit modes in the 14 metropolitan areas

Table 1-6.
Changes in Transit Ridership: 1985–95

Transit mode	Annual riders (millions) 1985	1995	Percentage change 1985–95
All modes	8,276	7,328	–11
Heavy rail	2,296	2,083	–9
Older subways[1]	2,033	1,696	–17
Modern systems[2]	263	387	47
Light rail	131	204	56
Traditional streetcars[3]	125	125	0
New light rail[4]	5	78	1,349
Commuter rail	269	344	28
Older systems[5]	262	324	24
New Services[6]	7	20	175
Bus	5,580	4,698	–16

[1] Boston, Chicago, Cleveland, New York, and Philadelphia.
[2] Atlanta, Baltimore, Los Angeles, Miami, San Francisco, and Washington, DC.
[3] Boston, Cleveland, Newark, New Orleans, Philadelphia, Pittsburgh, and San Francisco.
[4] Baltimore, Buffalo, Denver, Los Angeles, Portland (OR), Sacramento, San Diego, San Jose, and St. Louis.
[5] Boston, Chicago, New York, and Philadelphia.
[6] Baltimore, Miami, New Haven, Los Angeles, San Francisco, Washington, DC

SOURCE: (1) U.S. Department of Transportation, Federal Transit Administration, 1986. *National Urban Mass Transportation Statistics, 1985.* Washington, DC. (2) U.S. Department of Transportation, Federal Transit Administration. 1997. *1995 National Transit Database.* Washington, DC.

with new service[10] rose by 76 percent during this time, as the service provided by their expanding rail systems increased dramatically. At the same time, however, the number of bus riders—who accounted for more than 80 percent of all transit passengers in these cities during 1985—fell by 16 percent, partly as a result of the replacement of bus routes by rail lines in many of the most heavily traveled corridors in these cities. The net result was that total transit ridership in cities with new rail systems remained nearly unchanged over the decade. Transit ridership is most commonly measured by the number of passenger boardings. Boarding statistics may overstate the number of transit trips when rail service replaces major bus routes formerly serving the same corridors, because there may be an increased frequency of transferring between feeder buses and rail vehicles.

Ridership on the nation's older subway systems, which serve Boston, Chicago, Cleveland, New York, and Philadelphia,[11] declined 17 percent during this period, most likely in response to fare increases and a decline in downtown employment in some of these cities (see table 1-6). Consequently, by 1995 recently constructed systems carried nearly 19 percent of all heavy-rail passengers nationwide, up from 11 percent in 1985.

Ridership on streetcar lines that serve several older U.S. cities remained unchanged between 1985 and 1995, reflecting the maturity of the older residential suburbs and downtown areas they typically serve (table 1-6). The opening of modern light-rail service in several U.S. cities during that decade produced a large addition to the ridership, although much of this increase resulted from their substitution for major bus routes formerly serving the same corridors. Nevertheless, by 1995 these modern light-rail lines together carried well over half as many riders as the older streetcar systems remaining in U.S. cities.

The number of passengers carried by commuter railroads, which have traditionally carried riders to downtown Boston, Chicago, New York, and Philadelphia, increased by 24 percent from 1985 to 1995 (see table 1-6). Buoyed by the addition of new lines in Miami and New Haven and by a major extension of service in the Los Angeles metropolitan area, ridership on newer commuter rail services also increased rapidly

[10] Atlanta, Baltimore, Buffalo, Denver, Los Angeles, Miami, New Haven, Portland (OR), Sacramento, St. Louis, San Diego, San Francisco, San Jose, and Washington, DC.

[11] With the exception of the Cleveland subway, which was constructed during the 1950s, these systems date from the late 1800s and early 1900s.

during that decade. Even by the end of 1995, however, total patronage on these newer services amounted to only about 6 percent of the number of passengers riding commuter trains in their traditional markets.

The average number of passengers boarding transit vehicles during each mile they operate and the average number of passenger-miles per vehicle-mile are measures of transit use (see table 1-7). By these two measures, utilization of the passenger-carrying capacity provided by most transit modes declined between 1985 and 1995, with the exception of passenger boardings for commuter railroad service in traditional markets and in new light-rail service. Ridership on older subway systems fell, but high service levels were generally maintained. In addition, the continued extension of newer heavy-rail systems into lower density outlying areas—where it is difficult for even high-quality service to compete with automobile travel—reduced both measures of their use. Capacity utilization on older streetcar systems changed only slightly over the decade, reflecting the previously discussed stability in their ridership levels. The modern light-rail lines that began service during the decade experienced more frequent passenger boardings but lower average passenger loads than the system in San Diego that was already operating in 1985, probably reflecting the typically shorter trips made by their riders.

Table 1-7.
Changes in Transit Service Utilization

Transit mode	Boardings per vehicle mile 1985	Boardings per vehicle mile 1995	Average passenger load[1] 1985	Average passenger load[1] 1995
All modes	3.9	3.1	18	16
Heavy rail	5.2	4.0	23	20
Older subways[2]	5.4	4.2	23	20
Modern systems[3]	3.8	3.2	24	22
Light rail	8.2	6.0	22	22
Traditional streetcars[4]	8.8	7.9	21	20
New light rail[5]	3.2	4.4	28	23
Commuter rail	1.6	1.6	39	38
Older systems[6]	1.6	1.6	39	38
New services[7]	2.0	1.2	50	35
Bus[8]	3.8	2.9	13	11

[1] Passenger-miles per vehicle-mile.
[2] Boston, Chicago, Cleveland, New York, and Philadelphia.
[3] Atlanta, Baltimore, Los Angeles, Miami, San Francisco, and Washington, DC.
[4] Boston, Cleveland, Newark, New Orleans, Philadelphia, Pittsburgh, and San Francisco.
[5] Baltimore, Buffalo, Denver, Los Angeles, Portland (OR), Sacramento, San Diego, San Jose, and St. Louis.
[6] Boston, Chicago, New York, and Philadelphia.
[7] Baltimore, Miami, New Haven, Los Angeles, San Francisco, Washington, DC
[8] Number of urban areas served in 1985 = 298 and 1995 = 316.

SOURCES: (1) U.S. Department of Transportation, Federal Transit Administration, 1986. *National Urban Mass Transportation Statistics, 1985.* Washington, DC. (2) U.S. Department of Transportation, Federal Transit Administration. 1997. *1995 National Transit Database.* Washington, DC

Commuter rail service usage remained stable over the decade in its traditional big-city markets (Boston, Chicago, New York, and Philadelphia), while the expansion of service and the opening of new rail systems combined to sharply reduce both measures of usage in these markets (see table 1-7). Similarly, the frequency of passenger boardings on bus transit service fell greatly between 1985 and 1995, although the decline in typical bus passenger loads shown in the table was less pronounced, as the average trip length of bus passengers increased slightly over the decade. On balance, both the frequency of passenger boardings and the typical passenger loads carried by all transit vehicles declined, an indication that the overall capacity of the service they provided was less heavily used during 1995 than a decade earlier.

The concentration of transit ridership during commuting hours, the heavy directional orientation of these peak-hour passenger flows, and public demands to maintain some service during off-peak hours and over entire metropolitan areas combine to make underutilization of transit capacity not surprising.[12] As mentioned before, transit often serves broader public objectives, such as providing low-cost transportation alternatives for people without cars, and easing congestion, which are not reflected in ridership figures.

Transit Condition

The condition of urban transit equipment, as measured by the age of vehicles, varies a great deal by type of system, although overall there has not been much change between 1985 to 1995 (see table 1-8). The fleet of articulated, full-size, and mid-size buses has become older, but many smaller buses were added for paratransit services over the past few years, stabilizing the age of the total bus fleet. Between 1985 and 1995, the average age of heavy-rail vehicles increased, but dropped for light-rail vehicles. Commuter railcars aged, particularly powered railcars. The average age of commuter locomotives decreased slightly from 1985 to 1995.

In rail transit, the condition of power stations, systems, bridges and tunnels, and maintenance improved between 1984 and 1992 (see table 1-9). (USDOT FHWA FTA MARAD 1995) A survey of bus maintenance facilities in 1992 found that 57 percent were in good or excellent condition. (USDOT FTA 1993) Another 32 percent were found to be in poor or substandard condition, and the remaining facilities were found to be adequate. A survey of rail transit facilities found that overall conditions improved between 1984 and 1992, particularly those elements most in need of upgrading. (USDOT FTA 1992) Maintenance yards and facilities in bad or poor condition were significantly improved between 1984 and 1992 (see table 1-9).

Table 1-8.
Average Age of Urban Transit Vehicles

Type of vehicle	1985	1995
Commuter train locomotives	16.3	15.9
Unpowered commuter railcars	19.1	21.4
Powered commuter railcars	12.3	19.8
Heavy rail	17.1	19.3
Light rail	20.6	16.8
Articulated buses	3.4	10.9
Full-size buses	8.1	8.7
Mid-size buses	5.6	6.9
Small buses	4.8	4.1
Vans	3.8	3.1

SOURCES: (1) U.S. Department of Transportation, Federal Transit Administration, 1986. *National Urban Mass Transportation Statistics, 1985.* Washington, DC. (2) U.S. Department of Transportation, Federal Transit Administration. 1997. *1995 National Transit Database.* Washington, DC

U.S. Transportation Events

Every year the Bureau of Transportation Statistics discusses a few key events that caused major disruptions in transportation trends or that highlight a significant factor in transportation. This report looks at the effect of two snowstorms on transportation, one in the Northeast at the start of 1996 and the other at the end of 1996 in the Northwest. Transportation at the 1996 summer Olympic Games in Atlanta is also discussed here. Other noteworthy events that occurred in 1996, such as the rise in retail gasoline prices in the spring and summer, are discussed in subsequent chapters.

[12] During 1990, 43 percent of transit trips were for the purpose of commuting to and from work, and most commuting trips tended to be made during morning and evening rush hours. Another 22 percent of transit trips were for travel to school or church, primarily during weekday morning peak hours. (USDOT FHWA 1993, 4-68)

Table 1-9.
Physical Condition of U.S. Transit Rail Systems
(In percent)

	Bad		Poor		Fair		Good		Excellent	
Type of system	**1984**	**1992**	**1984**	**1992**	**1984**	**1992**	**1984**	**1992**	**1984**	**1992**
Stations	0	0	15	5	56	29	23	63	6	3
Track	0	0	7	5	49	32	31	49	12	14
Power systems										
Substations	6	2	23	19	5	17	43	56	23	6
Overhead	20	0	12	33	27	10	36	52	5	5
Third rail	13	0	26	21	19	20	36	53	6	6
Structures										
Bridges	1	0	16	11	51	28	28	54	4	7
Elevated	0	0	1	1	80	72	3	15	16	12
Tunnels	0	0	5	5	49	34	35	51	11	10
Maintenance										
Facilities	4	2	54	34	14	12	24	35	4	17
Yards	4	2	53	7	26	26	16	55	1	9

SOURCE: U.S. Department of Transportation, Federal Transit Administration. 1992. *Modernization of the Nation's Rail Transit Systems: A Status Report.* Washington, DC.

Weather Events

A heavy snow at the beginning of 1996 in the northeastern and mid-Atlantic regions and another heavy snow at the end of the year in the Northwest severely impacted transportation into, out of, and within those areas. Although these were not the year's only weather-related transportation problems, they were two of the more severe events.

On January 7 and 8, 1996, two feet of snow fell in the northeastern and mid-Atlantic states, paralyzing an area from Richmond, Virginia, to Boston, Massachusetts. Airlines and airports were very hard hit. Airports were closed from January 7, a Sunday, through noon on January 9, when runways began opening. During the afternoon of January 9, an additional six inches of snow fell. Normal operations at Logan Airport in Boston did not resume until January 11. The impact on airlines depended to a large extent on the proportion of service in the affected area. For instance, USAir, with one of its hubs at Baltimore-Washington International Airport, canceled nearly 50 percent of its scheduled flights. The number of stranded airplanes and passengers was minimized, however, by precanceling flights and flying planes away from the affected area. (*Aviation Week and Space Technology* 1996, 29, 32) In addition, many international flights were either canceled or diverted to distant airports. For instance, Delta Airline's incoming European flights were diverted to Atlanta, Cincinnati, and Orlando.

Intercity travel was also hindered for several days, as many highways up and down the East Coast were impassable. Rail was the only mode of transportation that allowed intercity travel in the Northeast Corridor, and Amtrak ran almost normal service. (Phillips 1996, D8) There were some delays as speeds were reduced, and many electric locomotives had to be taken out of service (diesel trains were largely unaffected by the snow). In addition, some major delays occurred on long-distance trains. For instance, the Chicago-Washington Cardinal was stuck in Charleston, West Virginia, for two days while tracks in New River Gorge were cleared. Without Amtrak, however, passenger travel between some major cities would have been all but curtailed.

Local transportation was a problem in most cities affected by the storm. New Jersey Transit ran no buses Sunday night and Monday. New York City Transit canceled buses on Monday after 200 got stuck in snowdrifts or were caught behind other vehicles. The District of Columbia came in for very heavy criticism because of its poor job of clearing roads.

Local transportation was also affected in the northwestern United States due to back-to-back storms beginning on Thursday, December 26, 1996. The Seattle area, for instance, first had up to 15 inches of snow and then another 6 inches fell on December 29, with ice storms in between. Parts of western Washington had 10-foot snowdrifts, prompting the governor to declare a state of emergency in 15 counties. (Egan 1996, D18) In the Seattle area, the King County Department of Transportation was forced to cancel transit service on Sunday, December 29, because many of its articulated buses became stuck in snow. This problem was exacerbated by the failure to plow or sand transit routes and low fuel reserves. Also, the trolley system broke down when overhead wires iced. Seattle was criticized for its snow-clearing plan, which did not prioritize routes leading to hospitals or those used for transit. In the Seattle area's rural Snohomish County, public transit was only slightly disrupted, because the local transit agency provided a list of routes for plowing. Only 3 of 62 routes were disrupted during the storms, although there were delays. (Nelson et al 1996)

Movement into and through the region was impacted in several ways. All three main routes across the Cascades in Washington state—Interstate 90 over Snoqualmie Pass, Route 2 over Stevens Pass, and Route 12 over White Pass—were closed by snow and then avalanches. Interstate 90 remained closed for several days beginning with the first snow, causing scheduled bus service over the Cascades to be canceled. Avalanches also closed a 45-mile stretch of Interstate 45 on the Oregon side of the Columbia River Gorge. (*New York Times* 1996, A11) An estimated 400 arrivals and departures were canceled when the Seattle-Tacoma International Airport closed. Flooding and mudslides caused Amtrak to cancel passenger trains between Seattle and Eugene, Oregon. (Eng 1996)

Olympic Games in Atlanta

Contrary to much of the media coverage during the Olympic Games in Atlanta (e.g., Drozdiak 1996, A1), the expanded transportation system put in place by various public agencies, including the Metropolitan Atlanta Rapid Transit Authority (MARTA) under contract with the Atlanta Committee for the Olympic Games (ACOG), was considered a success.[13] Over the 17 days of the event, the transportation system handled approximately 15,000 athletes and coaches from 197 countries, 20,000 media people, 49,000 staff, 80,000 special guests, and about 2 million spectators expected to use 11 million tickets. The

[13] Much of this account in based on a panel discussion "Transportation System Performance During the Atlanta Games: The Disaster That Wasn't" at the 76th Transportation Research Board Annual Meeting, January 13, 1997. The panel included Michael Meyer (Georgia Institute of Technology), David Williamson (Metropolitan Atlanta Rapid Transit Authority), Marion Waters (Georgia Department of Transportation), Andrew Bell (Hartsfield International Airport), Douglas Monroe (*Atlanta-Journal Constitution*), and Sam Subramaniam (Booz Allen and Hamilton, Inc.). (See also Applebome 1996, B18.)

transportation system moved approximately 18 million passengers in all, twice its normal load.

To manage this many passengers, MARTA opened 3.1 miles of new heavy rail into an area previously unserved and three new heavy-rail stations. MARTA also removed seats in heavy-rail passenger cars allowing them to carry 10 percent more passengers, borrowed 1,400 buses from transit agencies around the country, and extended service on some routes to 24 hours. The city also improved 11 pedestrian corridors with wider sidewalks, better lighting, and improved signage, and the Georgia Department of Transportation restriped Interstates for high-occupancy vehicle operation. Some companies hired private bus shuttles to get workers downtown during the games.

Another strategy to improve traffic flow, particularly during the work week, was to ask businesses to minimize commuter travel. Some businesses encouraged workers to take vacations during the games. Others arranged for employees to make their commute earlier or later, or if possible to telecommute. One company provided cots for essential workers to sleep at work. Ordinary business deliveries were suspended downtown. Overall, the program was largely successful, and it was reported that traffic ran smoothly during the work week. (Schwartz 1996, 3, 9)

During the games several forms of intelligent highway systems technology were deployed to manage traffic. Video cameras were used along freeways to monitor traffic conditions and accidents and breakdowns. Speed-detecting radar was used along several freeways. Surveillance allowed for rapid response to incidents and the implementation of management control strategies. Traffic information was also provided to the public in various ways: 44 changeable message signs were constructed on highways and more than 100 information kiosks were set up. Information was also available via a cable television channel dedicated to traffic information and an Internet site with real-time traffic information. (See chapter 11 for further discussion of information technologies and transportation.)

The Olympic Games also created many challenges for freight movement. Congestion in and around the Atlanta area caused many trucking firms to reroute their vehicles. During the games, motor vehicle traffic was prohibited from much of central Atlanta area, consequently trucks were only permitted to make deliveries between midnight and 6 a.m. Making things more difficult was the strict security precautions in effect during the games (heightened by the bombing in Centennial Olympic Park). All packages bound for an Olympic site had to be x-rayed, each truck had to have a thorough inspection every day, drivers had to be accredited by the Atlanta Council of Governments and have a background check, and vehicles parked for any length of time had to have security personnel guarding them. Faced with these constraints, United Parcel Service (UPS) arranged large deliveries of packages to the area after midnight; couriers on foot made deliveries throughout the day. UPS and another package delivery firm, DHL, experimented with helicopters to bring in freight, using 16 locations around the city and 50 helicopters. Freight shipments by rail, including food products, increased substantially just before the Olympics. During the Olympics, tightened security around one of CSX's rail lines that passed close to the games and heightened restrictions on hazardous materials transportation affected both CSX and Norfolk Southern trains. (Bradley 1996)

There were a number of transportation problems, particularly in the first few days of the games. One highly publicized case involved rowers from Britain, Poland, and Ukraine who hijacked a bus to get to an event. In another case, a judo wrestler missed his event because of traffic congestion.

Some difficulties were caused by bus drivers from other cities who were recruited for the games and had little knowledge of Atlanta and no experience driving on major freeways. About 50 of the 3,000 bus drivers resigned early because of such problems. Transportation officials attempted a solution by having escorts with knowledge of the area ride along and give directions.

While some of these relatively minor events were given high visibility by the media, there were also newspaper reports that many athletes had no transportation problems. Efforts by government and Olymic officials helped to ensure adherence to planned services and traffic patterns, thus alleviating many problems.

References

American Public Transit Association (APTA). 1985. *1985 Transit Fact Book*. Washington, DC.

_____. 1990. *1990 Transit Fact Book*. Washington, DC.

American Short Line Railroad Association (ASLRA). 1995. *1994 Annual Data Profile of the American Short Line and Regional Railroad Industry.* Washington, DC.

Amtrak. 1997. *Twenty-Fifth Annual Report, 1996.* Washington, DC.

Applebome, P. 1996. Atlanta: Day 4—Traffic; Athletes' Challenges: Getting There. *New York Times.* 23 July.

Association of American Railroads (AAR). 1995. *Railroad Facts: 1995 Edition.* Washington, DC.

_____. 1996. *Railroad Facts: 1996 Edition.* Washington, DC.

Aviation Week and Space Technology. 1996. Winter Storm Cripples East Coast Air Operations. 15 January.

Aviation Week Group. 1997. *Aviation & Aerospace Almanac. 1997.* New York, NY: McGraw Hill.

Bradley P. 1996. Delivering the Olympics. *Logistics Management* 35, no. 8:28–37.

Drozdiak. W. 1996. Transportation Problems Plague Olympics: IOC Reprimands Atlanta Organizers as Tensions Mount at 1996 Games. *Washington Post.* 23 July.

Egan, T. 1996. A Calm Between the Storms Helps the Pacific Northwest. *New York Times.* 31 December.

Eng, L. 1996. More Snow on the Way: Seattle Area Begins To Dig Itself Out—In Time To Get Buried Again. *The Seattle Times.* 28 December.

Galenson, A. and L.S. Thompson. 1994. *The Evolution of the World Bank's Railway Lending,* World Bank Discussion Paper No. 269. Washington, DC.

Nelson, D., E. Nalder, L. Eng, and S. Byrnes. 1996. Storm Bested Buses, Hills: Metro's Fleet Called Unsuited for Heavy Snow. *The Seattle Times.* 31 December.

New York Times. 1996. Snow and Rain Shut Down Much of the Northwest. 30 December.

Pisarski, A. 1995. The Demography of the U.S. Vehicle Fleet: Observations from the NPTS. *1990 NPTS Report Series: Special Reports on Trips and Vehicle Attributes.* Washington, DC: U.S. Department of Transportation, Federal Highway Administration.

Phillips, D. 1996. Amtrak Answered the Call, Station to Station: Despite Delays, Service Cuts, High Costs, the Trains Got Through. *Washington Post.* 11 January.

Schwartz, J. 1996. Earning It: A Marathon of

Disruption for Corporate Atlanta. *New York Times*. 21 July.

Texas Transportation Institute (TTI). 1996. *Urban Roadway Congestion, 1982–1993, Volume 2*, TTI Research Report 1131-8. College Station, TX.

U.S. Army Corps of Engineers. 1996a. *Lock Characteristics*. Washington, DC.

_____. 1996b. *U.S. Waterway System Facts*. Washington, DC. December.

_____. 1996c. *Transportation Lines of the United States, 1995*. Washington, DC.

_____. 1996d. *Waterborne Commerce of the United States, 1995*. New Orleans, LA.

U.S. Department of Commerce (USDOC). 1996. *Statistical Abstract of the United States, 1996*. Washington, DC.

U.S. Department of Transportation (USDOT), Office of the Assistant Secretary for Public Affairs. 1996. Peña Announces First All-American Road, National Scenic Byway Designations. Press release. 19 September.

U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics (BTS). 1996. *National Transportation Statistics 1997*. Washington, DC. December.

_____. 1997. *1993 Commodity Flow Survey: United States Highlights*. Washington, DC. February.

U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics (BTS), Office of Airline Information (OAI). 1997. Informational material.

U.S. Department of Transportation (USDOT), Federal Aviation Administration (FAA). 1996. *Administrator's Factbook*. Washington, DC.

___. 1997a. *Administrator's Factbook*. Washington, DC.

___. 1997b. *General Aviation and Air Taxi and Avionics Survey, Calendar Year 1995*. Washington, DC.

___. Various years. *FAA Statistical Handbook of Aviation*. Washington, DC.

U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA). 1986. *Personal Travel in the United States, Volume 1, 1983–1984, Nationwide Personal Transportation Study*. Washington, DC.

_____. 1993. *Nationwide Personal Transportation Survey: 1990 NPTS Databook, Volume 1*. Washington, DC.

_____. 1994. *The National Bicycling and Walking Study: Transportation Choices for a Changing America*. Washington, DC.

_____. 1996. *Highway Statistics 1995*. Washington, DC.

_____. Various years. *Highway Statistics*. Washington, DC.

U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA), Federal Transit Administration (FTA), and Maritime Administration (MARAD). 1995. *1995 Status of the Nation's Surface Transportation System: Condition and Performance*. Washington, DC. 27 October.

U.S. Department of Transportation (USDOT), Federal Transit Administration (FTA), Office of Policy. 1992. *Modernization of the Nation's Rail Transit Systems: A Status Report*. Washington, DC.

____. 1993. *Bus Support Facilities: Conditions and Needs*. Washington, DC.

U.S. Department of Transportation (USDOT), Maritime Administration (MARAD). 1996a. *Maritime Administration 1995 Annual Report*. Washington, DC.

_____. 1996b. *A Report to Congress on the Status of Public Ports of the United States, 1994–1995*. Washington, DC.

Welty, G. 1996. Greater Volume, Limited Capacity: How a Shrinking Industry is Coping with Growth. *Railway Age*. September.